## CLAIMS

What is claimed is:

1        1.    A method of scheduling cable modems using virtual

2    upstream channels in a broadband communications system,

3    comprising:

4        segregating a transmission area reserved for said

5    virtual upstreams according to a first set of constraints;

6    and

7        enabling each of said cable modems to transmit data in

8    accordance with a second set of constraints and in

9    accordance with said segregation.


1        2.    A method according to claim 1 wherein said cable

2    modems are grouped by which virtual upstream channel they

3    belong to.


1        3.    A method according to claim 2 wherein said

2    transmission area is segregated by subdividing said

3    transmission area into a transmission sub-area for each

4    virtual upstream channel, the cable modems belonging to a

5    virtual upstream channel enabled to transmit only in its

6    corresponding transmission sub-area.

1    4.    A method according to claim 3 wherein each said

2    transmission sub-area occupies a contiguous portion of said

3    transmission area.


1    5.    A method according to claim 3 wherein each said

2    transmission sub-area is distributed and not contiguous

3    over said transmission area.


1    6.    A method according to claim 1 wherein said first

2    set of constraints is to provide optimal utilization of

3    said physical upstream channel by said cable modems.


1    7.    A method according to claim 1 wherein said second

2    set of constraints includes providing latency

3    differentiation among said cable modems.


1    8.    A method according to claim 6 wherein enabling

2    includes:

3    providing bandwidth allocation request messages to

4    said system.


1    9.    A method according to claim 8 wherein enabling

2    further includes:

3    converting said request messages to a unified form;

4    and


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5    scheduling said requests in their unified form in

6    accordance with said second set of constraints.

1       10. A method according to claim 1 wherein information

2    elements in MAP messages are synchronized among all said

3    virtual upstream channels.

1       11.  A method of scheduling cable modems using virtual

2    upstream channels in a broadband communications system,

3    comprising:

4       segregating a transmission area reserved for said

5    virtual upstreams according to a first set of constraints;

6       providing bandwidth allocation request messages to

7    said system;

8       converting said request messages to a unified form;

9    and

10    scheduling said requests in their unified form in

11    accordance with a second set of constraints.

1       12.  A method according to claim 11 wherein said cable

2    modems are grouped by which virtual upstream channel they

3    belong to.

1       13.  A method according to claim 12 wherein said

2    transmission area is segregated by subdividing said

3  transmission area into a transmission sub-area for each

4  virtual upstream channel, the cable modems belonging to a

5  virtual upstream channel enabled to transmit only in its

6  corresponding transmission sub-area.

1      14.  A method according to claim 13 wherein each said

2  transmission sub-area occupies a contiguous portion of said

3  transmission area.

1      15.  A method according to claim 13 wherein each said

2  transmission sub-area is distributed and not contiguous

3  over said transmission area.

1      16.  A method according to claim 11 wherein said first

2  set of constraints is to provide optimal utilization of

3  said physical upstream channel by said cable modems.

1      17.  A method according to claim 11 wherein said

2  second set of constraints includes providing latency

3  differentiation among said cable modems.

1      18. A method according to claim 11 wherein information

2  elements in MAP messages are synchronized among all said

3  virtual upstream channels.

1      19.  An article comprising a computer-readable medium

2    having instructions stored thereon which when executed

3    cause:

4      segregating a transmission area reserved for said

5    virtual upstreams according to a first set of constraints;

6    and

7      enabling each of said cable modems to transmit data in

8    accordance with a second set of constraints and in

9    accordance with said segregation.

1      20.  An article according to claim 19 wherein said

2    cable modems are grouped by which virtual upstream channel

3    they belong to.

1      21.  An article according to claim 20 wherein said

2    transmission area is segregated by subdividing said

3    transmission area into a transmission sub-area for each

4    virtual upstream channel, the cable modems belonging to a

5    virtual upstream channel enabled to transmit only in its

6    corresponding transmission sub-area.

1      22.  An article according to claim 21 wherein each

2    said transmission sub-area occupies a contiguous portion of

3    said transmission area.

1       23.    An article according to claim 21 wherein each

2   said transmission sub-area is distributed and not

3   contiguous over said transmission area.


1       24.    An article according to claim 19 wherein said

2   first set of constraints is to provide optimal utilization

3   of said physical upstream channel by said cable modems.


1       25.    An article according to claim 19 wherein said

2   second set of constraints includes providing latency

3   differentiation among said cable modems.


1       26.    An article according to claim 24 wherein enabling

2   includes:

3       providing bandwidth allocation request messages to

4   said system.


1       27.    An article according to claim 26 wherein enabling

2   further includes:

3       converting said request messages to a unified form;

4   and

5       scheduling said requests in their unified form in

6   accordance with said second set of constraints.

1    28. An article according to claim 19 wherein

2    information elements in MAP messages are synchronized among

3    all said virtual upstream channels.

1        29.  An article comprising a computer-readable medium

2    having instructions stored thereon which when executed

3    cause:

4        segregating a transmission area reserved for said

5    virtual upstreams according to a first set of constraints;

6        providing bandwidth allocation request messages to

7    said system;

8        converting said request messages to a unified form;

9    and

10        scheduling said requests in their unified form in

11    accordance with a second set of constraints.

1        30.  An article according to claim 29 wherein said

2    cable modems are grouped by which virtual upstream channel

3    they belong to.

1        31.  An article according to claim 30 wherein said

2    transmission area is segregated by subdividing said

3    transmission area into a transmission sub-area for each

4    virtual upstream channel, the cable modems belonging to a

5    virtual upstream channel enabled to transmit only in its

6    corresponding transmission sub-area.


1        32.    An article according to claim 31 wherein each

2    said transmission sub-area occupies a contiguous portion of

3    said transmission area.


1        33.    An article according to claim 31 wherein each

2    said transmission sub-area is distributed and not

3    contiguous over said transmission area.


1        34.    An article according to claim 29 wherein said

2    first set of constraints is to provide optimal utilization

3    of said physical upstream channel by said cable modems.


1        35.    An article according to claim 29 wherein said

2    second set of constraints includes providing latency

3    differentiation among said cable modems.


1        36. An article according to claim 29 wherein

2    information elements in MAP messages are synchronized among

3    all said virtual upstream channels.